Remarks

Claims 1, 3, 5 and 6 have been amended to define clearly the Applicants' invention. Claims 2, 4 and 7 to 10 have been cancelled without prejudice or disclaimer. New claims 11 to 14 have been added to define further the Applicants' invention. Claims 1, 3, 5, 6 and 11 to 14 are now pending in the present application and are believed to distinguish patentably over the prior art.

In the Official Action, the Examiner has rejected claims 1 to 9 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,649,012 to Gupta et al. ("Gupta"). The Examiner is alleging that the Applicants' invention as defined by these claims is clearly disclosed by Gupta. Claim 9 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Gupta in view of U.S. Patent No. 5,818,945 to Makino et al. ("Makino"). The Examiner is alleging that the Applicants' invention as defined by these claims would be obvious to one of ordinary skill in the art in view of the teachings of these references. Applicants respectfully submit that the Examiner's objections in view of the cited references are inappropriate for the reasons set forth below.

According to one aspect of the Applicants' invention as defined by independent claim 1, Applicants provide an echo cancelling system for cancelling echoes in a communication path. The echo cancelling system includes an echo locater coupled to the communication path to locate positions of echo signals in a signal time window received from the communication path. The echo locator includes a first adaptive filter generating a transfer function approximating that of the communication path. An echo canceller is coupled to the communication path to cancel echo signals received therefrom. The echo canceller includes a second adaptive filter having selectable filter coefficients. Peaks in the transfer function are used by the echo locater to generate output signals to activate selected filter coefficients of the second adaptive filter corresponding to the positions of echo signals in the signal time window received from the communication path. The output signals have magnitudes proportional to the magnitudes of the peaks.

In contrast, Gupta discloses a method for synthesizing an echo path in an echo canceller. Near end and far end signal samples are obtained at the echo canceller. The echo in a background task is located using a whitened version of the signal. The echo location information is transferred to a foreground task and the echo is eliminated in the incoming signals by filtering the signals in the location passed to the foreground task by the background task. In order to synthesize the echo path, two processes are used, namely a differential energy peak picker

(DEPP) and an absolute energy peak picker (AEPP). During the DEPP process, the energy of the filter coefficients is summed and placed in energy bins. Eight filter coefficients, or taps, are added together and placed in bin such that 48 bins are created. The arithmetic difference of the current energy bin values and the corresponding energy bin values computed the previous time is calculated. If the difference for a given bin exceeds a given positive threshold, then the differential energy bin count associated with that bin is incremented. If the difference is less than a given negative threshold, then the differential energy bin count associated with that bin is decremented. This operation is performed for each bin. After all differential energy bin counts are computed, a threshholding is done on the counts. If any bin count is below a minimum threshold, the background filter coefficients are set to zero because the echo path, if there was an echo, has changed. If the background is not reset, then for any bin with a bin count greater than a given threshold, a one is loaded in a differential energy window buffer corresponding to that bin, else, a zero is loaded. This process is repeated until all 48 bins have been compared to the threshold value. Any differential energy bin having a value of one, indicates that an echo is present in that window. The differential energy window buffer is transferred to a window transfer operation.

The AEPP process performs a more thorough identification process and determines the bins with energy values more than a predetermined percentage of the highest bin energy. For energy bin counts higher than a minimum value, a one is loaded in an absolute energy window buffer corresponding to those bins. A zero is loaded in the absolute energy window buffer for energy bin counts below the minimum value. The absolute energy window is also transferred to the window transfer operation. During the window transfer operation, the two energy window buffers are processed through a logical "OR" function. If there are any echo locations present in the resultant "OR'd" information that are not present in the foreground window buffer, then the "OR" of the differential energy window buffer and absolute energy window buffer is placed in the foreground window buffer. This value synthesizes the echo path by providing location and length information. No transfer is made if the echo information in the foreground task is the same as the information derived in the background task.

As will be appreciated, Gupta fails to teach or suggest an echo locater that uses peaks in the transfer function to generate output signals to activate selected filter coefficients with the output signals ***having magnitudes proportional to the magnitudes of the peaks***. The Gupta reference simply uses two different techniques to locate echoes and to assign a digital logic "one" value identifying echo locations ***irrespective of the magnitudes of the energy bin values above the thresholds***. The digital logic values are then OR'd and the results of this operation are

conveyed to the echo canceller. Accordingly, Applicants respectfully submit that independent claim 1 distinguishes patentably over Gupta.

Makino discloses a subband echo cancellation method using a projection algorithm. A received signal is output to an echo path and is divided into a plurality of subbands to generate subband received signals, which are applied to estimated echo paths in the respective subbands to produce echo replicas. The echo having propagated over the echo path is divided into a plurality of subbands to generate subband echoes, from which the corresponding echo replicas are subtracted to produce misalignment signals. Based on the subband received signal in each subband and the misalignment signal corresponding thereto, a coefficient to be provided to each estimated echo path is adjusted by a projection or ES projection algorithm.

Applicants respectfully submit that Makino fails to teach or suggest an echo cancelling system as defined wherein the echo locator uses peaks in the transfer function to generate output signals to activate selected filter coefficients of an adaptive filter corresponding to the positions of echos in a signal time window with the output signals having magnitudes proportional to the magnitudes of the peaks. Accordingly, Applicants respectfully submit that independent claim 1 distinguishes patentably over Makino either alone or in combination with Gupta.

As claims 3 and 5 are dependent either directly or indirectly on independent claim 1, which is deemed allowable, Applicants respectfully submit that these claims should also be allowed.

Independent claims 6 and 11 recite subject matter similar to that recited in independent claim 1 and thus, are believed to distinguish to patentably over the cited references for the same reasons set forth above. As claims 12 to 14 are dependent either directly or indirectly to independent claim 11, which is deemed allowable, Applicants respectfully submit that these claims should also be allowed.

In view of the above, it is believed the application is in order for allowance and action to that end is respectfully requested.

Respectfully submitted,
BEYER WEAVER & THOMAS, LLP

C. Douglass Thomas
Reg. No. 32,947

P.O. Box 70250
Oakland, CA 94612-0250